PATENT CLAIMS

1. An injector comprising:

a cylinder with a longitudinal axis and an inner wall;

a solid piston free of cavities and being inserted into the cylinder without a preset orientation, the piston having a piston body and two or more deformable sealing elements, which deformable sealing elements each abut the inner wall of the cylinder at an abutting interface and seals an annular gap between the piston body and the inner wall of the cylinder;

a hypodermic needle attached to an outlet at an outlet end of the cylinder opposite an actuating end of the cylinder; and

a piston rod having a tubular section for housing the hypodermic needle, the tubular section having a needle insertion end comprising an engagement device for engaging a complementary engagement device of the outlet or the hypodermic needle, and a needle protection end opposite the needle insertion end, which tubular section comprises an actuating surface to directly contact and push the piston, wherein the piston rod has a length, which is equal to or larger than an operating length of the cylinder defined by the distance from the actuating end of the cylinder to the outlet end of the cylinder minus the dimension of the piston parallel with the longitudinal axis;

wherein the piston is free of connecting features to connect to the piston rod, and wherein the actuating surface of the piston rod is free of connecting features to connect to the piston.

2. The injector according to claim 1, wherein each deformable sealing element has a convex surface.

3. The injector according to claim 1, wherein the piston is symmetrical relative to a transverse plane.

4. The injector according to claim 1, wherein the piston has a Shore A hardness in the range of 50 to 90.

5. The injector according to claim 1, wherein the piston does not comprise any pigments or dyes.

6. The injector according to claim 1, wherein the piston rod has a thumb plate.

7. The injector according to claim 1, wherein the piston rod has an elastomeric material located so that the tip of the hypodermic needle is sealed by the elastomeric material when the hypodermic needle is inserted into the tubular section.

8. The injector according to claim 1, wherein the device for actuating the piston is at the needle insertion end.

9. The injector according to claim 1, wherein the injector is prefilled with a pharmaceutical composition.

10. The injector according to claim 1, wherein the piston body and the deformable sealing element are of the same material.

11. The injector according to claim 1, wherein the piston is made by injection moulding.

12. The injector according to claim 11, wherein the piston is made from a styrene block copolymer.

13. The injector according to claim 1, wherein the inner wall of the cylinder comprises a lubricant having a kinematic viscosity in the range of 100 cSt to 15,000 cSt.

14. The injector according to claim 1, wherein the cylinder has an inner diameter of up to 45 mm.

15. The injector according to claim 1, wherein the cylinder has an inner diameter in the range of from 2 mm to 10 mm.

16. The injector according to claim 1, wherein when the hypodermic needle is attached to the outlet of the cylinder the hypodermic needle does not project into an interior of the cylinder at the outlet end.

17. An injector comprising:
a cylinder with a longitudinal axis and an inner wall;
a solid piston free of cavities and being inserted into the cylinder, the piston having a piston body and two or more deformable sealing elements, which deformable sealing elements each abut the inner wall of the cylinder at an abutting interface and seals an annular gap between the piston body and the inner wall of the cylinder;
a hypodermic needle attached to an outlet at an outlet end of the cylinder opposite an actuating end of the cylinder; and
a piston rod having a tubular section for housing the hypodermic needle, the piston rod comprising an actuating surface to directly contact and push the piston;
wherein the piston is free of connecting features to connect to the piston rod, and the actuating surface of the piston rod is free of connecting features to connect to the piston.